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ABSTRACT

Career-technical educators face three issues in credentialing through assessment. First, the occupational credentialing domain is large and evolving, and a clear understanding of it is a prerequisite to considering adoption of a credential. Three types of credentialing are registration, certification, and licensure. Credentialing organizations are categorized by their mission (government regulatory board, trade association, vendor-specific, National Skills Standards Board). Oversight organizations are professional organizations that disseminate information and provide voluntary oversight by evaluating credentialing systems. Second, a set of clear, comprehensive standards is needed to define credential quality and credibility. Proposed evaluative criteria/standards to select assessment-credentialing are marketability, recognition, alignment to curriculum, quality of input standards, quality of assessments, and usability for career-technical education (CTE) setting. Third, CTE policymakers and educators need a rational, efficient process to evaluate credential systems and associated assessments against a set of standards. The following nine steps are the process: (1) define purposes and uses of occupational credentialing systems; (2) set evaluation criteria; (3) identify credentialing systems and evaluate preliminary link to programs; (4) conduct initial screening; (5) determine quality of input standards; (6) determine quality of credentialing assessments; (7) conduct final linkage to curriculum; (8) determine marketability and recognition; and (9) develop data collection procedures. (Contains a 53-item bibliography.) (YLB)

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Evaluating Credentialing Systems: Implications for Career-Technical Educators

Commissioned Paper for the National Skill Standards Board

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Introduction

In this paper, occupational or industry-based credentialing is considered from the perspective of the policymaker in career-technical education (CTE). A credential is awarded to an individual who meets predetermined qualifications maintained by a credentialing body (Browning, Bugbee & Mullins, 1996; Schmitt, 1995; Shimberg, 1981). The qualifications usually are a combination of education, experience, and test scores. Ananda and Rabinowitz (1995) and Losh (2000) have noted that standards and occupational credentials can be important features of the CTE domain. Policymakers considering the adoption of credentialing might view the intended consequences as increasing access to occupations, signaling competence on the part of graduates, and demonstrating responsiveness of the educational system. Briefly, *providing access* refers to developing an alternative route by which individuals can enter the labor market, *signaling competence* refers to documenting capabilities of CTE graduates, and *demonstrating responsiveness* refers to signaling at the level of the educational or employment system. On the other hand, there may be unintended and less desirable consequences of adopting credentials.

A selected set of examples helps to triangulate the current importance of credentialing. At the national level, the National Skill Standards Board (NSSB) is a strong advocate of certification as an integral part of its skill standards initiatives. In various publications, the NSSB has advocated bottom-up development of assessment-credentialing systems by voluntary partnerships (NSSB, 2000b, 2001b). At the state level, California awarded multiple grants during 2002 to Local Education Authorities for implementing industry-based credentials in career technical education programs for high school students. Other states, Pennsylvania and Virginia for example, systematically identify and screen industry credentials. At the credential-provider level, students in CTE programs may seek credentials from a range of organizations. Large-scale credentialing systems, for example the Automotive Service Excellence (ASE) designation, are used in conjunction with automotive mechanic and collision technician programs. Another large domain of application is the information technology sector, in which vendor-specific networking or database administration credentials abound.

Career-technical educators face three important issues in credentialing through assessment. First, the occupational credentialing domain is large and evolving, and a clear understanding of the domain is a prerequisite to considering adoption of a credential. Second, a set of clear and comprehensive standards is needed to define the quality and credibility of credentials. Third, career-technical policymakers and educators need a rational and efficient process to evaluate credential systems and associated assessments against a set of standards. In this review, the credentialing domain is described, a set of standards for evaluating the quality of a credential is proposed, and a collaborative process for evaluating credentials for CTE programs is illustrated. The evaluation process relies heavily upon analysis of intended, as well as unintended, consequences of use within the CTE system.

Credentialing: A Large and Evolving Domain

In this section, an overview of the credentialing domain is provided. A comprehensive treatment of the domain may be found in the edited book by Schoon and Smith (2000). First, three types of credentialing—registration, certification, and licensing—are defined, ordered from least to most restrictive. As part of this description, an overlap between certification and licensing is noted. Next, credentialing organizations are categorized. Finally, oversight organizations in the credentialing domain are described; these professional organizations disseminate information and provide voluntary oversight by evaluating credentialing systems.

The observation that the credentialing domain is large and evolving parallels one offered thirty years ago by Shimberg, Esser, and Kruger (1973). The size stems from the large number of organizations, varying in size and orientation, that offer credentials. For example, Microsoft and Cisco are large business firms within the information technology sector. The National Automotive Technical Education Foundation (NATEF) and the National Retail Federation (NRF) are industry-based foundations. The American Association of Occupational Health Nurses (AAOHN) typifies a professional association. The evolutionary change stems from the emergence of new credentials and from revisions of credential content standards and assessments. The research and practice knowledge base of the field is also expanding (Impara, 1995; Bugbee et al., 1996; Haladyna, 1997).

Types of Credentialing

Occupational credentialing include three specific types: registration, certification, and licensure. In this paper, the term "credentialing" is used to refer to the entire domain and "certification" is used only for the specific type of credentialing (as opposed to the more common usage of "certification" for both the domain and the specific type) in order to avoid confusion. Although the three types are distinct in theory, in practice there may be overlap between certification and licensure.

Registration. Registration is the least restrictive form of regulation, usually requiring individuals to file their names, addresses, and qualifications with a government agency before practicing their occupation. It may include posting a bond or filing a fee. Registration provides a 'title' more than anything else because individuals do not have to pass examinations to be registered.

Certification. Certification is sometimes referred to as "title control". It may be offered by a governmental body or by a profession (non-governmental organization, or NGO) that gives right-to-title to persons meeting predetermined standards. Candidates usually must pass a certification exam. Certifications are granted to individuals who have met predetermined qualifications set by the certification agency within a profession. A certification is a formal recognition of professional or technical competence. Certification often may have legal implications for the certifying organization. Certification is divided into two broad domains: minimum competency standards and advanced knowledge standards. Minimum competency standards are used to represent what is deemed acceptable for an entry-level practitioner. Examples include Peace Officer certification, or Certified Public Accountant. Advanced knowledge standards are used to signal advanced knowledge and skill

within a profession. These are often specialization areas within occupations, for example cardiologists in medicine, tax specialists in accounting, or network administrators in information technology.

Licensure. The term licensure is often referred to as "practice control"—a person cannot legally perform the occupation without the appropriate license. The primary purpose of licensure is the protection of the public. It is the most restrictive form of regulation imposed by the government agencies, and is often referred to as the "right-to-practice." It is illegal under licensure laws for a person to practice a profession without first meeting state or provincial standards. Licensure is mandatory (in order to engage in the specified set of activities). Licensing is a process by which an agency of government grants permission to an individual to engage in a given occupation upon finding that the applicant has attained the minimal degree of competency required to ensure that the public health, safety, and welfare will be reasonably well protected. Occupational and professional licensure is an activity reserved to each state by the federal constitution; and involves the exercise of the state's legitimate policing power. The essence of licensure seems to be "protection of the public" although there are critiques that suggest an underlying desire to protect territory and exclude others from practice.

By 1952, more than 80 separate occupations had been licensed by state law. By 1986, at least 800 professions were licensed. Collectively regulated licenses exceeded 1000 professions in 1990 and continue to increase (Impara, 1995). For approximately 60 occupations (e.g., medicine, nursing, engineering) comparable licensing requirements exist in all states, thus establishing a national umbrella. For *most* professions, however, the requirements vary from state to state. While protection of the public is a core reason for licensure, clearly professional groups have stretched this meaning to attain multiple ends. The literature identifies these ends as including (1) enhanced economic benefits for practitioners, (2) increased status, (3) protection of the reputation of the profession, and (4) symbolic respectability. Last, licensure supports payment of services by third-party payers (i.e., insurance companies) and control over the number and geographic distribution of practitioners.

Issues in types and vocabulary. Several issues are implied in these definitions. One issue is overlap. In general terms, registration, certification, and licensure are distinct types of occupational credentialing, but in practice there is overlap between them. They are not exclusive, especially in the healthcare field. The Ohio Peace Officer Certification, for example, is required by law for an individual to seek employment as a police officer in Ohio, but it is called a *certification* rather than a *license*. According to Schmitt and Shimberg (1996) distinctions between licensure and certification became less obvious in the 1970s, as many allied health groups chose to forego licensure and concentrate upon certification. A second issue is continuing competence. Change in occupations, together with lifelong learning, suggest that continuing competence must be addressed. (Tamblyn, 1994). A third issue is the legal implications for the credential provider that are associated with the various levels. These liabilities arise from the consequences of error—either error in awarding a credential to a candidate who is not qualified or error denying a credential to someone who is qualified.

Credentialing Organizations

Organizations offering credentials fit into broad categories described by their mission. These missions, which may be mixed, cluster into professional/public protection and profit motives. Table 1 below describes several different credentialing organizations. As noted by Mahlman, Jeong, and Austin (2000), these include government-granted certifications and licenses and non-governmental certifications offered by trade association or by proprietary vendors. The last row shows the generic CorePlus model advocated by the NSSB (2001b). This inclusion is warranted, we believe, because of the contributions of the NSSB. These include a common language for skill standards integrating work- and worker-oriented elements and creation of the voluntary partnership process. The authors encourage consideration of the implications of skill standards and certification for bridging CTE and workforce development (Ananda & Rabinowitz, 1995; Losh, 2000; National Skill Standards and Assessment Collaborative, 1998).

Table 1: Selected Credentialing Organizations

Type	Example	Credential
Government Regulatory Board	Cosmetology www.state.oh.us/cos/	State license (i.e., Ohio) based on a multi-part National Collaborative assessment
Trade Association	National Automotive Technical Education Foundation (NATEF)	Automotive Service Excellence (ASE) certification, based on assessment scores and performance standards
Vendor-Specific	Microsoft Office User Specialist (MOUS) www.microsoft.com/traincert/mcp/mous/	Microsoft Official Certificate with successful test score
NSSB	CorePlus "Model"	Proposal to document core standards *plus* one specialization

Oversight Organizations

Two voluntary oversight organizations focus on certification, licensure, and associated issues. One is the Council on Licensure, Enforcement, and Regulation (CLEAR) (www.clearhq.org) and the second is the National Organization for Competency Assurance (NOCA; www.noca.org). CLEAR was established in 1980 and has evolved into an international "community" for those involved in professional and occupational regulation. NOCA was established in 1977 to focus on setting quality standards for credentialing organizations through its National Commission on Certifying Agencies, and those standards were recently revised (NCCA, 2002). Each group holds annual meetings and conferences, provides technical assistance, and serves as a clearinghouse. Membership includes a wide range of representation, including individuals as well as credentialing organizations (state regulatory boards, private providers, and professional associations). Both oversight organizations disseminate

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information, including the NOCA handbook on certification (Browning, Bugbee, & Mullins, 1996), guidance for establishing cutoff scores (NOCA, 1999), issues involved in certification testing via Internet (NOCA, 2001), and explanatory material on the nuts and bolts of certification examinations for board members (CLEAR, 1993). The two organizations collaborated on *Principles of Fairness* (CLEAR & NOCA,1993), which is organized around activities before, during, and after a credentialing test. In summary, one implication of these organizations is that the credibility of a credentialing organization is enhanced if it belongs to one or both of these associations.

Quality Standards for Credentials

Occupational credentialing in principle offers CTE stakeholders several benefits. Stakeholder groups include students, parents, educational systems, businesses, and government agencies. Some potential benefits for students include increased marketability, greater respect from peers and management, increased job opportunity, more opportunities for advancement, and greater self confidence. The adoption of industry-based credentials also has the potential to offer benefits to educational systems. Good credentialing systems help CTE educators to document student competence. Furthermore, positive results or trends in results on credentialing exams could add considerable credibility to career-technical programs for many stakeholders. Business firms would gain if the assessment and credentialing system provided clearer signals about what individuals could do (Bishop, 1996; Rosenbaum, 2002; Zemsky, 1997). While the potential benefits are great, there are many industry credentials and all are not created equal.

Credentials vary on many dimensions, including marketability and recognition of the credential, alignment of the underlying standards to the CTE curriculum, quality of the input standards used to create the test plan and items, technical quality of the assessment system (procedures, tests, and items), and usability in educational settings. The selection of credentials for CTE students must be performed carefully and systematically in order for students to realize the potential benefits. Selection of poor credentialing systems will likely perform a disservice to students and other stakeholders in the educational credentialing system. Some of the unintended consequences to stakeholders are negative publicity if scores appear low or declining, teacher-administrator conflict over apparently poor student performance, misrepresentation of student/worker competence, wasted time and financial resources, and reduced motivation for students.

Before the selection of industry-based student credentialing systems can occur, CTE policymakers must define the purposes for adopting the credential and make some key decisions. Key decisions include at least the following:

- Will the credential standards or curriculum need to fit with current state standards or curriculum?
- Will the credentialing assessment system be used for state and/or federal accountability purposes or for program improvement purposes?
- Will the credentialing system be used to market CTE graduates and/or programs?

Depending on the answer to these and similar questions, criteria or standards for selecting industry-based student credentialing systems and the relative emphasis on each will vary.

Given these sorts of questions, how should policymakers think about assessment-credentialing systems and evaluate competing systems? The answer involves evaluative criteria that can be applied to evaluate existing certifications or to develop novel certifications. This section proposes the standards defined in Table 2 below. These specific standards are ones that could potentially differentiate competing systems on quality. The standards are then integrated into a recommended process for selecting assessment-credentialing systems.

Table 2. Evaluative Criteria for Assessment-Credentialing Systems

Criterion	Clarifications/Assumptions
Marketability	If related to an increased preference in hiring and an increase in wages, marketability is greater.
Recognition	If accepted by many hiring organizations across a wide geographical area, recognition is greater.
Alignment to Curriculum	If closer match between content measured by the credentialing test(s) and content of CTE curriculum presented, alignment is greater.
Quality of Input Standards	Appropriateness of the standards upon which the credential is based: How were they developed? Are they current? Validated?
Quality of Assessments	Appropriateness of assessments on which credentialing decisions rely. Are they reliable, valid, & fair? Evaluation against standards, for example the Standards for educational and psychological testing (American Educational Research Association [AERA], American Psychological Association [APA] & National Council on Measurement in Education [NCME], 1999), or the ETS Test Quality Review
Usability for CTE Setting	System features: assessment cost, timing, availability of test results to educators/administrators, and data format

Marketability and Recognition

If a credentialing system is evaluated on the basis of marketability and recognition, the extent to which benefits are realized by students and/or CTE programs is a consequence of using the system. This suggests consideration of both intended and unintended results of using an assessment. First, are the intended consequences of adopting the system actually occurring? One short term outcome, for example, is improved access and signaling. In the longer term, adoption predicts an increase in labor market efficiency. Second, there should be anticipation and minimization of unintended negatives. An example of an unintended negative consequence is lower pass rates than expected even though the CTE curriculum is aligned with the credential content domain (as in Automotive Technology and

Automotive Body Repair). The management of negative consequences might include monitoring the pass rates as a credential is rolled out to a state and crafting communications with stakeholders to provide a context for the pass rates and expectations for their improvement over time. Information on marketability and recognition of a credential may be obtained through such activities as:

- Communication with industry associations other than the association offering certification
- Interviews and surveys—for example, surveys of credentialed workers that investigate their perceptions of the value of the credential, or surveys of employers
- Follow-ups of certified individuals to study their short-term and long-term uses of the credential

Alignment with Curriculum

Fairness in testing requires that students have been exposed to and have had an opportunity to learn the material being tested. Alignment is the technical term for how different systems match, and two aspects of it are important. The first is the extent of overlap between the curriculum presented and the credentialing assessment. What proportion of the curriculum is covered by the credential assessment system? If a credential covers only a small portion of the curriculum, then the program as a whole cannot be evaluated by credentialing rates. A deficiency in coverage may be addressed by using multiple credentials that provide adequate coverage when used in combination. Second, there is the extent to which a credential addresses content that is not covered in the curriculum. This goes back to fairness in testing. A student's achievement should not be evaluated by a credentialing test covering material that a student has not had the opportunity to learn. Evaluations conducted using this type of data perform an extreme disservice to the students and the programs being evaluated. Studying the alignment of the credential content domain and the CTE curriculum might include the following activities:

- Having a panel of experts (1) match the claimed credential content to the curriculum and (2) evaluate overlap and contamination (illustrated in the process used by the Virginia Department of Education to award "diploma seals" in CTE)
- Having a panel of experts match the credential test items (or samples of test items) to the curriculum and rating percentage of overlap and contamination

Quality of Input Standards

Most credentials signal that an individual has attained a level of competence, defined as knowledge or skill, in a prescribed content area. One consideration in the choice of a system is appropriateness of the content standards upon which the credential is based. Are they current and validated? Has job, occupational, or role analysis been used to delineate the duties, tasks, and associated knowledge or skill needed to perform within an occupation? Job, occupational, or role analyses generally include interviews and focus groups with individuals performing the job, observations

of workers, and surveys to validate and weight the resulting descriptions of the job. The job and task analyses, or role delineation studies, define the content covered by a credentialing assessment and the relative emphasis placed on content areas. Four study descriptions provide illustration of the process. Cameron, Beemsterboer, Johnson, Mislevy, Steinberg, and Breyer (2000) completed a cognitive task analysis of dental hygenists. Niebuhr and Muenzen (2001) described a study of the practice of perianesthesia nursing in order to update two credentialing examination programs. McMillan, Heusinkveld, Chai, Murphy, and Huang (2002) presented a thorough discussion of a role delineation study and its use to revise the blueprint for the Oncology Certified Nurse examination. Raymond (2002) reviewed practice analysis for credentialing assessment organized around six questions, providing a state-of-the-art review from the perspective of a credentialing professional.

Such analyses, whether of jobs, practice, or roles, form the foundation of assessments and training procedures. The appropriateness and the timeliness of the results are critical to the quality of the credentialing system. Examining the quality of input information (job analysis, content standards) might include the following procedures:

- Examining documentation about procedures used to establish the content of the credentialing system.
- Examining task analyses to determine appropriateness of weighting of content standards.
- Verifying the quality of standards, as illustrated in parallel surveys of perceived importance of the standards within each of eight allied health areas by Lyons, Greening, and Robeson (2000).
- Studying the test specifications derived from the input materials.

Technical Quality of the Assessment System

Test quality, often under the umbrella label of validity, is a function of the procedures used to develop the test and the psychometric properties of the test and test items. Most validation evidence is of the content nature, given that the purpose is to assess a candidate's level of knowledge and/or skill (Shimberg, 1981; Mehrens, 1997b). There are several sources that provide professional guidance, both general (AERA, APA & NCME, 1999) and specific to the certification domain (Haladyna, 1997; Impara, 1995). Other factors in test quality might include the extent to which the test is perceived to (1) be secure, (2) be current, and (3) avoid poor wording, graphics, and grammatical problems. Test administration procedures can be reviewed for their appropriateness, their standardization, and their security. Determining the quality of an assessment involves studying not only test development and administration procedures but also the empirical quality of the resulting assessments. Were the test specifications created from the content standards based on a quality job analysis (Raymond, 2002; Smith & Hambleton, 1990)? Who were the item writers and what were their qualifications? How were pass/fail cutoff scores determined? What procedures were used to establish the reliability and validity of the assessments? What were the results of those studies of reliability and validity? Are the test items themselves clear and free from grammatical errors? Are the distractors for multiple-choice

items plausible yet always incorrect? Are the assessments appropriate for the target population? Appropriateness, within the context of CTE, means that there is a consideration of whether students will be able to meet all of the *qualifications* maintained by the certifying organization. For example, if there are experience requirements and a high school student will not have an opportunity during their CTE program of study (typically the last two years), then requiring a certification will be unfair.

Evaluation of test quality derives from judgments by individuals with expertise in testing and psychometrics. Their evaluations can be supported by additional judgements about the test and test items from content experts, editors, and graphics specialists. Evaluating test quality might include the following activities:

- Having testing expert or panel of experts examine assessment technical manuals.
- Interviewing test developers via phone or email to fill-in missing information.
- Collecting additional evidence of reliability, validity, and fairness, if insufficient evidence exists or to extend the validity of the assessment (e.g., judgment-based and/or empirical procedures such as administering assessments to estimate reliability, demonstrating convergent validity, and/or establishing criterion-related validity by correlating credentialing test scores with external criteria, as shown in the psychometric analysis of a Canadian provincial examination for massage therapists by Violato, Salami, and Muiznieks [2002]).
- Having tests reviewed by content experts, or subject matter experts.
- Reviewing the procedures used to establish performance standards (Cizek, 2001; Kane, 1994; Plake, 1998).
- Having tests reviewed by proofreaders and graphics specialists.

Usability in Educational Settings

Consider a credential that is of high quality, valid for the proposed uses, recognized, and marketable—but is not usable for demonstrating student achievement or for collecting accountability data. Several features influence usability. Examples are cost and timing of the assessment, availability of test results to educational institutions, and data format. Depending on use of credentialing results, another feasibility issue might be the degree to which the results across various credentialing systems are comparable. The impact of cost would be influenced by the source of funds. Fees for credentialing examinations may exceed $100.00. Who pays? Possible sources of funding include the state department of education, the school, and/or the student. Issues of timing, resulting from experience requirements for a credential, are also critical to data collection. If a student is required to spend two years in an apprenticeship before he or she can complete a credentialing exam, outcome data (Pass, Fail) might be available too late for external reporting cycles or too late for timely program improvement. The availability of data to school districts for these purposes is critical. Can student test

results be obtained directly from the credentialing organization or must districts rely on voluntary self-report by students? In what format are data provided? Is the format congruent with existing reporting mechanisms? In developing a system for utilizing industry-based credentialing to demonstrate CTE student competence, procedures are needed to collect student data and to enter that data into some form of information management system with archival capabilities. Sample activities for evaluating usability or feasibility might include the following:

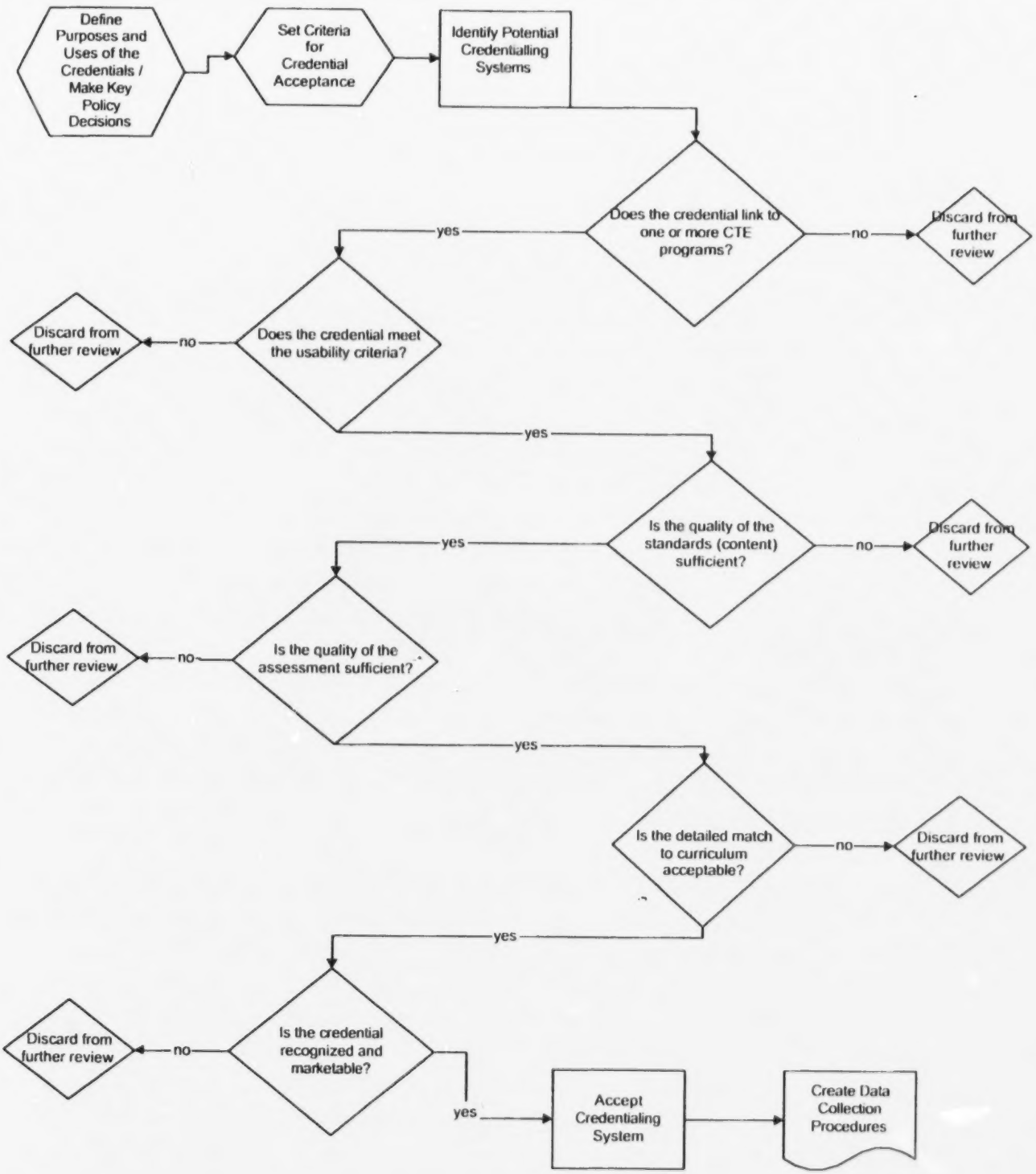
- Establishing criteria with respect to cost, timing, data collection procedures, and format.
- Screening available credentials with respect to the criteria.
- Planning a system for collection of student data on credentialing results.

A Collaborative Process for Evaluating Credentials

Given the large number of occupational credentials, is there an efficient way to apply these quality standards to evaluate potential credentials for CTE usage? First, screening credentialing systems and their associated assessments is not a novel idea. Showers (1999) uses the term "audits" to refer to such a review and multiple organizations offer such services. We briefly note several existing systems to provide a context for our proposal. Examples include the standards of the National Commission for Certifying Agencies (2003), the test review process used internally by ETS (2002), and the models proposed by the NSSB, the Buros Institute for Assessment Outreach and Consultation (BIACO), and the American National Standards Institute. The accreditation of credentialing organizations or programs can yield great value to those responsible for selecting industry-based credentialing programs for use in CTE. By reviewing the accreditation standards, the consumer of credentials can reasonably assume that at least those aspects of the accredited credentialing program hold integrity. However, since these accreditations are voluntary, a drawback is that currently only a relative handful of credentialing programs are accredited. As an example, BIACO provides on their website a listing of credentialing organizations in information technology that have achieved accreditation based on a set of customized evaluative criteria (www.unl.edu/BIACO).

The process should begin with the least expensive and most efficient screens. An example would be document review for a certification system. Documents reviewed might include marketing materials, informational brochures, and technical manuals for the assessment. More labor intensive screens (panel reviews, tryouts) can be completed as a list of eligible systems is refined. Although details of the proposed review might be customized for districts and for states, an ongoing review would provide fairness to certification assessment vendors. The proposed 9-step process is presented as a flowchart below, and then each step is described in detail.

Selection of Credentialing Systems for CTE



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1. **Define the purposes and uses of occupational credentialing systems.** The first step is to define the purpose for adopting a credentialing system. This definition is important to evaluate whether the system is working. If multiple purposes are to be served, the relative importance of each purpose should be established. The uses and purposes of the certification system will affect the criteria that will be chosen as well as their relative weights. Among the reasons for adopting external credentialing for career-technical education students are the following:

   - Increasing marketability of students (preferences in hiring, wages, promotion).
   - Recognizing professionalism for students (possibly for teachers and programs).
   - Enhancing credibility of programs (marketability applied to the program level).
   - Documenting competency attainment for accountability or impact reporting purposes.
   - Documenting competency attainment for program review and improvement purposes.

   Further, key policy decisions will need to be made in conjunction with defining the purposes and uses of the industry-based credentialing system. For example, will the standards on which the assessments are based replace or complement the state's current system of occupational standards, competencies, or curriculum? This decision will have implications for the degree to which the certification content must match current curriculum. Will the certification assessment system be used for state and/or federal reporting purposes? If so, assessment system quality and usability in educational settings become critical, and data collection procedures need to be established.

2. **Set evaluation criteria.** Answers to policy questions influence the relative emphases placed on criteria for evaluating credentialing systems. Criteria must be based on the purposes and proposed uses of the credentialing system. Emphasis on criteria can be distributed across marketability or recognition, linkage to curriculum, quality of input standards, technical quality of the assessment system, and usability in educational settings. Relative weighting depends on purposes and uses of the system. Usability criteria should be established a priori and should be transparent, that is, publicly available. They could, for example, include cost, timing of the assessments, availability of data to educational systems, and the format of that data. Depending on the system used to examine linkage to the curriculum, one might determine acceptable percentage levels of curriculum overlap. Other criteria, for example level of marketability or psychometric quality, may be more judgmental and require refinement as one begins the process of examining credentialing systems.

3. **Identify credentialing systems and evaluate preliminary link to programs.** Once criteria are set, credentialing systems need to be identified and initial links established between these systems and the state's CTE programs and curricula. The initial link to a program is a cursory review and match based on the title of the credential and any readily available description of the

credential. At this time, less attention is paid to the criteria because of the time required to complete a comprehensive review. However, many credentialing systems may be immediately marked for elimination if it is apparent that the criteria are not met.

4. **Conduct initial screening.** This stage involves an examination of descriptions of the credential with attention being paid to its perceived linkage to the curriculum, how it fares against the usability criteria, and any other criteria that can be quickly assessed. The goal here is to screen as many credentials as possible by examining characteristics of the credential that are easily obtainable and easy to review. This task might involve searching the web and contacting credentialing organizations for information. A more thorough linkage to the curriculum will be conducted at a later time, after further screening. Despite the initial nature of this step, documentation of the screening process should be thorough.

5. **Determine the quality of the input standards**. Before determining quality of credentialing assessments, one should examine the quality of their foundation. Was a thorough job or occupational analysis performed? What were the qualifications and backgrounds of the subject matter experts that delineated the duties, tasks, and knowledge and skill needed to perform the job? Was a task analysis performed? Was the geographical representation of the analysis appropriate for your population? How critical is the established content of the credential to performance of the job or features of the job being credentialed?

6. **Determine the quality of credentialing assessments.** Credentials surviving the initial screening should be examined against psychometric quality criteria. Here, professional staff contact the credentialing organization to obtain technical manuals and any other information that will describe test development procedures, psychometric quality information, and validation procedures and results. This step may involve independent content and grammatical reviews of items. If the purposes of the credentialing system include using it for individual, state, and/or federal accountability purposes or other high-stakes purposes, then quality of the credentialing assessments becomes critical.

7. **Conduct final linkage to the curriculum.** The most direct method of determining the overlap and contamination of the assessments with respect to the curriculum is to have a panel of subject matter experts link the actual test items to the curriculum. This linkage will allow a quantitative determination of how much of the curriculum is covered, how well it is sampled, and the degree to which content is measured that is not part of the curriculum. The most efficient way to perform this would be to have the credentialing organization perform this linkage on a preliminary basis, with verification by subject matter experts familiar with the curriculum. Note that linkage to the state-adopted standards or curriculum is not an issue when the industry-based credential will replace the state adopted standards or curriculum. However, determining the degree to which the standards or curriculum are too rigorous or not rigorous enough for the targeted educational program may be an issue.

8 **Determine marketability and recognition.** Determining marketability and recognition become important when one of the purposes of the system is to enhance the marketability of the student and/or the CTE program. The task of evaluating marketability and recognition in some cases will involve thorough investigative work and thus will be labor-intensive. For this reason, it is saved only for credentialing systems meeting all other criteria. This task will require interviews obtained from multiple sources and/or surveys of employers and employees. The purpose of this step is to determine how widely the credential is recognized and what employment benefits the student might experience by holding the credential.

9. **Develop data collection procedures.** If the purposes of the credentialing system include use of scores for individual, state, and/or federal accountability or program improvement purposes, then data procedures must be put in place. Procedures must be developed to collect the data on credentialing results and attach that data to individual students in an information management system. This would involve discussions and arrangements with the credentialing agency to develop data sharing procedures. Timing of data sharing is a critical issue here, especially when the CTE system must have the data available for external state or federal reporting purposes. Also, when working with minors one must attend to Family Educational Right To Privacy Act (FERPA) issues as well as state laws regarding use of data.

Conclusion

In closing this review, we wish to emphasize the following points. First, the screening of systems for use in credentialing CTE students should be approached with diligence. The consequences for students, teachers, programs, employers, and other stakeholders of a poor credentialing system can be great. Through careful planning and the appropriate allocation of resources, the selection of quality industry-based credentials for documenting CTE knowledge and skill attainment can yield immense benefits for students and for educational systems. Second, a prominent role was given to the idea that both use and consequence of use are important desiderata in evaluation of credentialing system. Messick (1995) argued that the consequences of usage must be considered in both intended and unintended senses, although the addition of consequences remains controversial in validation theory (Mehrens, 1997a). If viewed as worthwhile, suggested strategies for addressing consequential validity include focus groups and other stakeholder panels (Lane & Stone, 2002). As an example of how consequences could be anticipated and managed in the context of CTE, it may be possible to work with the credentialing organization to establish customized performance standards (cutoff scores) for secondary CTE student. The intent of such standards would be to recognize the differences in knowledge and/or skill between the emerging workforce and such populations as postsecondary students or current occupational practitioners.

In developing this review, certain larger implications became apparent to the authors. Among them are two that warrant particular attention: use of credentialing-assessment for system reform and ensuring coverage of all important worker characteristics. First, the implication that occupational credentialing-assessment can play a role in systemic reform may be contradictory to a "back to basics" movement. The "back to basics" movement places increased emphasis on basic academics and decreased emphasis on career and workplace preparation. The proposed evaluative criteria and screening process for credentialing-assessment could be transported outside of the secondary domain, for example to the community college or proprietary school. Second, if credentials are to be used it is important to ensure coverage of all worker characteristics, ranging from the specific to the general. The accomplishment of this objective is enhanced by consideration of the NSSB common language framework to describe both work (critical work functions, key activities, performance indicators) and the worker (academic, employability, and occupational skills). The academic and employability skills, in particular, must be taught and assessed.

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